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ABSTRACT

Most professionals in the field of educational technology have served as change agents; it is no accident that one domain in the current definition of the field specifies a sociological theory base linked to practice that includes diffusion, adoption, implementation and institutionalization of innovations. This paper emphasizes the implementation phase of the planned change process. A review of the literature is provided, leading up a description of the author's research on change in libraries. Using some hints about facilitating conditions from Mayhew (1975), the author identified the following eight conditions that appeared to facilitate the implementation of education technology innovations: (1) dissatisfaction with the status quo; (2) existence of knowledge and skills; (3) availability of resources; (4) availability of time; (5) rewards or incentives exist; (6) participation; (7) commitment; and (8) leadership. Continued searching for further confirmation in the literature has strengthened confidence in these eight conditions. This paper concludes with recommendations for future research in this area. (Author/AEF)

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NEW PERSPECTIVES ON THE IMPLEMENTATION OF EDUCATIONAL TECHNOLOGY INNOVATIONS

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Most professionals in the field of educational technology have served as change agents. They were destined to perform this role since they introduce concepts, procedures and products that are often foreign to those with whom they work. It is no accident that one domain in the current definition of the field (Seels and Richey, 1994) specifies a sociological theory base linked to practice that includes diffusion, adoption, implementation and institutionalization of innovations. This paper will emphasize the implementation phase of the planned change process.

Adoption is not the end

For education professionals who are interested in this process, the current "in" word is implementation. Rogers' earlier works (1962, 1971) speak mostly of diffusion and adoption; Hall's Concerns-Based Adoption Model (1979, 1987) addresses the issues and actions prior to adoption in his early studies and later, the levels of use--a precursor to concerns about implementation. Fullan (1982; 1991) includes implementation within his framework of the change process: initiation, implementation, continuation and outcomes. It seems that it is time to focus on implementation. Almost every instructional development model from the early Instructional Development Institute (IDI) model (University Consortium for Instructional Development and Technology, 1968) to current models that focus on computer-based learning (Hannafin and Peck, 1988) include implementation. Clearly, this is a time to focus on this phase of the change process.

The diffusion precursors

Rogers paved the way with his Diffusion of Innovations (1962, 1971, 1995). His presence at Michigan State University at the same time as Charles Schuller, Kent Gustafson and Ed Caffarella provided convenient and compatible relationships with the field of instructional technology. One of the earliest studies that blended Rogers' concerns and those in the evolving field of instructional development was on rejection of new educational media (Eicholz, 1975). Rogers continued to be embraced by our field and AECT over the years. In fact, he was the keynote speaker for the 1997 convention in Albuquerque.

Rogers' initial emphasis was on diffusion--spreading the word (if not the seed; his field was agricultural sociology). His influence has led to several

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thousand studies, many related to education and instructional technology. The aim of most of Rogers' work was adoption--of a new idea, product or practice. Offshoot efforts during the golden years of NDEA's Title VII (a) research grants were labeled Research, Development and Dissemination (RD&D). These studies focused on adoption of innovations as a result of the dissemination (diffusion) efforts. Not much was said about what follows adoption. Rogers' early models ended with innocuous terms like "continuation".

About the same time Educational Technology Publications published Havelock's The Change Agent's Guide to Innovations in Education (1973). The fact that this publisher chose to promote this book is further confirmation of the field's interest in the change process. A few years later, the results of a major RAND study on federal programs supporting change (Berman and McLaughlin, 1977) also advanced knowledge about the actual use of innovative practices in the schools. At last there was a recognition that implementation was a vital part of the process.

Implementation emerges

In the field of education, Michael Fullan emerged as one of the scholars and practitioners of implementation. His classic article with Alan Pomfret (1977) laid out the territory nicely and introduced the steps beyond adoption. Fullan's orientation has been Education and his more recent works (1991, 1996) refine his earlier ideas. Implementation is the payload. What does adoption mean if it is not followed by implementation? Implementation has been asssumed but not much has been done to describe its nature and the special conditions that apply as users go beyond the point of adoption.

Over the years there have been studies and explorations into the resistance factors that thwart diffusion and implementation efforts. Prominant among those who have journeyed into this puzzling morass are Zaltman and Duncan (1977) and Havelock and Huberman (1978). The basic argument has been that if we knew what types of resistance exist, perhaps we could design strategies to combat them.

Turning resistance around

A less common approach to understanding the process of implementation has been to tease out reasons for successful efforts. Where innovations have been adopted and implemented, what were the conditions that appeared to facilitate the process? Are there consistencies among the facilitating conditions from innovation to innovation and from place to place? This reverse logic reverses a concern for resistance to one of facilitating factors--an avenue for further exploration.

My investigation began in 1975 after being asked to speak at a conference on change in libraries sponsored by the University of Illinois Graduate School of Library Science. Using some hints about facilitating conditions from Mayhew (1975), I came up with a list of factors that seemed to explain successful implementation. Encouraged by a positive response to an initial article (Ely, 1976) about the conditions, I reviewed the literature and found considerable confirmation that the conditions I had identified were indeed common in many successful implementation efforts. About this time, questions about cross-cultural applications arose so, in 1989, I applied (and received) a Fulbright award for research in the American Republics. I re-visited Chile and Peru where I introduced educational technology concepts in 1963 and 1975. I met with individuals who had worked with me 15-25 years earlier and explored which ideas that had been introduced earlier were still working and why. I also went to Indonesia where I discovered a set of recordings made by a graduate student who had begun to study the factors that stimulated growth of educational technology in that country. He asked many of the questions I was asking. (He never finished his dissertation but his ground work was a major contribution to my study.)

The Conditions

The international visits not only confirmed the existence of the eight (8) conditions determined earlier, the study also validated their presence in other cultures and added some confidence that the conditions might be generalizable in a variety of settings.

After the international phase of the study I was bold enough to publish an article on those findings (Ely, 1990). The eight (8) conditions that appeared to facilitate the implementation of educational technology innovations were listed with rationale to support each. Since then, there have been nine dissertations using the conditions as a framework in various contexts: a university instructor up-grading project in Indonesia (Haryono, 1990), introducing computers in schools (Bauder, 1993), implementing peer coaching in a junior high school (Jeffrey, 1993), site-based management in schools (Read, 1994), introduction of a gender equity curriculum in middle schools statewide (Riley, 1995), implementation of instructional television at the U.S. Military Academy (Marovitz, 1994), implementation of freshman introductory courses in a university (Stein, 1996), comparison of two military training programs--one successful and the other not (Ellsworth, 1998) and high use of the Internet by teachers (Ravitz, 1999).

The early international studies and the dissertations based on the eight conditions that have emerged in each subsequent study and have been confirmed by other studies of change and implementation. Each condition is described below.

1. **Dissatisfaction with the status quo.** Something is not right. Things could be better. Others are moving ahead; we are standing still. There must be something we can do to improve our situation. Whether the dissatisfaction is an innate feeling or an induced state (as brought about by marketing campaigns, for example) it is an emotion that calls for change. In most of the studies this condition was not the most important factor in bringing about implementation but it was generally agreed that it has a place in the mix of conditions. It was most often linked to *leadership*.

2. **Existence of knowledge and skills.** The knowledge and skills are those required by the ultimate user of the innovation. It seems evident that such a condition should be in the list and indeed, it was consistently near the top of the list as one of the most important factors leading to implementation. It was frequently linked to *resources, rewards and incentives, leadership, and commitment*.

3. **Availability of resources.** This condition refers to the things that are required to make implementation work. It includes hardware, software, publications, audiovisual media and other teaching materials. Reference to funding in general is also an indicator of the money required to obtain these resources. Other examples are access to a copy machine, clerical help, and instructional supplies. This condition is linked to *commitment, leadership and rewards and incentives.*

4. **Availability of time.** Implementators need time to acquire knowledge and skills, plan for use, adapt, integrate and reflect upon what they are doing. This means good time, "company" time, paid time arranged for by the organization where the innovation will be implemented. It sometimes means the willingness of individuals to contribute some of their own personal time to the process. Time is linked to *participation, commitment, leadership and rewards and incentives.*

5. **Rewards or incentives exist.** The studies discovered a minor conflict between the words "reward" and "incentive." An incentive is something that serves as an expectation of a reward or fear of punishment. It serves as a stimulus to move an individual to action. A reward is something given for performance--an action that demonstrates satisfaction with a job well done. The complication is extended by the difference between an extrinsic reward and an intrinsic reward. Extrinsic rewards can be observed; intrinsic rewards are internal to the individual. It is difficult to measure the "satisfaction" that may be felt by users of the innovation.

It may be that the potential conflicts in interpretation led to less importance of this factor in most of the studies. Even though the condition was present in all of the studies, it was reported to be of lesser importance.

The linkages were to: *participation, resources, time, and dissatisfaction with the status quo.*

6. **Participation.** This is another ambiguous term that may have caused some variation in interpretation. However, it was confirmed as an important factor in all the studies. Participation means shared decision making; communication among all parties involved in the process and, when direct participation is not possible, the implementors should feel that their ideas are represented through a surrogate. Participation was reported as a strong condition and was linked to: *time, commitment, knowledge and skills, and rewards and incentives.*

7. **Commitment.** This condition demonstrates firm and visible evidence that there is endorsement and continuing support for implementation of the innovation. This factor may be expressed by the primary leader (a principal of a school, for example) or a group, such as a board of directors. This condition is usually measured by the perceptions of the implementators rather than public acknowledgement of policy. It is closely linked to leadership and strongly related to *time, resources and rewards and incentives.*

8. **Leadership.** Leadership, in this case, is two-pronged: (1) leadership of the executive officer of the organization, and sometimes of a board, and (2) project leadership which is more closely related to the day-to-day activities of the innovation being implemented. Once the executive leadership is evident, then the project leadership becomes even more important because the person who can help with the implementation is closer to the user.. Leadership is linked to: *participation, commitment, time, resources and rewards and incentives.*

Conditions in other sources

Continued searching for further confirmation in the literature has strengthened confidence in these eight (8) conditions.

In Australia, Clarke (n.d.) discovered factors that influence changing teacher roles. Among the twelve (12) factors he mentions are; "the principal and school community," "internal support personnel," "the spirit of collegiality, collaboration, and experimentation," "innovative curriculum materials," "the inservice program," "external support personnel," "outcomes valued by the teacher," and "teacher knowledge."

Further confirmation can be found in a study by Hubbard and Ottson (1997) reporting a case study of an innovation from its early introduction to its mandated implementation. Key phrases from their report are instructive. Potential users should see "the advantage of the innovation over current

practice." "The relationship among participants in the change process..." is what really matters. Key words in the article provide further consistency with Ely's conditions: "a sense of ownership," "pride in visible results," "felt need," "active commitment of district leadership," "policymakers...provided resources, an institutional home, official blessing, and even emotional support for (the project)."

Baker (1994) reports features that were identified with success in a project on educational partnerships involving technology. "...shared vision; clearly-defined goals, equal relations among partners; local decision-making; sufficient resources; involvement of top-level administrators; personal and professional rewards for collaboration; careful choice of project coordinators; and sufficient time."

Murphy's article, "Creating successful schools," (1998) highlights four "imperatives" that lead to implementation in school change settings: "commitment," "leadership," "communal (culture)," and "resources."

The Cognition and Technology Group at Vanderbilt (CTGV) provides confirming insights from a report on The Jasper Project (1997). Organization around "...shared problems and projects," "collaboration (of a multidisciplinary group)," "work...based on a combination of intrinsic and extrinsic motivation," "tools that support productivity," "support for technology tools," "constraints on time," and "connectedness to a broader community of audiences" all seem to fall within the conceptual structure of the eight conditions.

A Policy Brief from the RAND Corporation (1994) spells out lessons from early innovators in vocational education. Their observations offer further evidence of the conditions' validity. "A major reform...requires...development of appropriate curricular materials and the training of teachers. Teachers need time, resources and guidance to develop materials....Teachers also need to be trained in the use of teaching techniques that support activity-based learning..." "Even where enthusiasm and commitment were initially strong, a lack of funding eventually led to teacher resentment...."...those that enjoyed a large measure of local autonomy were better able to integrate school transition practices...."

In a report of the National Governor' Association (David and Goren, 1993) suggestions for overcoming barriers to change urged governors to: "Send clear and consistent signals" (leadership, commitment), "Give priority to professional development" (knowledge and skills), "Balance top-down and bottom-up strategies" (participation), "Create feedback mechanism for policymakers" (participation), "Make mid-course corrections" (commitment), and "Focus attention on education as a public good" (leadership). Other

references in the report refer to "incentives for change," communication, and a clear direction.

In The NEA Today (1996) Judith Warren Little was quoted on the conditions for successful teacher development: adequate time, teacher knowledge, shared accountability (participation), teacher participation, access to rich professional materials and technology (resources) and subsidized teacher professionalism outside the classroom (time and rewards).

Wilson (1994) lists the key elements in the successful implementation of a computer development program at the Peakview Elementary School in Colorado. They are: "computers abundantly available in the classroom" (resources), "shared commitment and vision of school reform with technology as an essential component" (commitment), "a supportive district and principal" (administrative support), "a strong computer coordinator" (administrative support), "early and thorough teacher training" (knowledge and skills), "taking computers home" (time and rewards) and "user-friendly systems" (knowledge and skills).

Other reports reiterate these conditions over and over again. See, L. Roberts, (1993) and M.B. Haslam (1998).

Related to the issues of implementation in schools is Hall's CBAM model with its Level of Use (LoU) scale (1975) and more recently his Innovation Configuration which uses maps of the implementation process to estimate the degree of implementation (Alquist, Hendrickson, et. al., 1998). Some modification of the LoU scale has been proposed by (Moersch, 1995) which he calls Levels of Technological Implementation based on measuring classroom use of computers. The momentem is increasing. Hall and Moersch both provide useful guidance regarding the extent of implementation. The extent of implementation offers a rich opportunity for further research.

Conclusions and recommendations

It is clear that the eight conditions are present in varying degrees when studied in terms of successful implementations of innovative programs and products. What is not so clear is the role of the setting in which the innovation is implemented. It appears from the studies that the setting and nature of the innovation are major factors influencing the degree to which each condition is present.

Also problematic are the definitions of the terms used to describe each condition. Single words can be ambiguous and misleading. Further descriptions of each term should be developed, with examples, to reduce the ambiguity. The conceptualization of the conditions should be refined to overcome potential linguistic difficulties.

It is clear that there is no emerging heirarchy yet. The relative strength and importance of each condition, when considered together, has not been determined. Strength and importance emerge as functions of the context and the innovation.

Each of the studies mentioned here tried to unearth additional conditions that are not within the scope of the eight that have been confirmed. There was some indication that "trust" might be an additional condition but there is insufficient evidence to support that notion now. Most of the additional conditions suggested by the subjects who participated in the studies were conceptual synonyms of the eight words or phrases.

The mix of personal and institutional characteristics is sometimes confusing. There is overlap and interrelationship among the conditions. Yet it is very difficult to separate them. If an organization is a systemic body, all elements contribute to its functioning. To separate and highlight any facets of the conditions framework minimizes the impact of the total construct.

These shortcomings should not reduce the utility of the findings. They do provide some guidance for future research in this area. While it is difficult to generalize about the existence of these conditions it is clear that they differ in magnitude according to the innovation being studied and the environment in which it is used. They do offer useful indicators and serve as guidelines as we amble down the ambiguous artery that leads to implementation and change. The conditions are offered here as one more step toward understanding this thing we call implementation in the process of planned change.

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